ED-S678.7T

LIBRARY

MAY 14 1971

HARVARD UNIVERSITY

VOL. 15 PART 2

TRANSACTIONS

OF THE

SOCIETY FOR BRITISH ENTOMOLOGY

World List abbreviation: *Trans. Soc. Brit. Ent.*

CONTENTS.

CRISP, D. T.

Some Corixidae (Hemiptera-Heteroptera) from Bog and Moorland Waters

DATE OF PUBLICATION, 30TH JUNE 1962

Copies may be purchased from the Publications Secretary, Department of Entomology, The Museum, Manchester 13

Price 5/- post free

Published for the Society
by the British Trust for Entomology Ltd.

BRITISH TRUST FOR ENTOMOLOGY LTD.,
41 QUEEN'S GATE, LONDON, S.W.7.

LIST OF PUBLICATIONS FOR SALE (ALL PRICES ARE POST FREE)

TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

GENERAL

A New Chapter in Zoological Nomenclature: The Reforms instituted by the Thirteenth International Congress of Zoology, Paris, July, 1948. By F. Hemming, 1950. 8 pp., 1s. 6d.

The Problem of stability in Specific Nomenclature, with special reference to cases where type material is no longer in existence. By F. Hemming, 1951. 16 pp., 2s. 0d.

Some adaptations of insects to environments that are alternately dry and flooded, with some notes on the habits of the Stratiomyidae. By H. E. Hinton, 1953. 20 pp., 3 figs., 5s. 0d.

The terms "Larva" and "Nymph" in Entomology. A summary of the views of W. E. China, H. Henson, B. M. Hobby, H. E. Hinton, T. T. Macan, O. W. Richards, T. Southwood, and V. B. Wigglesworth, followed by a review of The Terminology of Juvenile Phases of Insects by R. G. Davies, 1958. 10s. 0d.

ENTOMOLOGICAL FAUNA OF THE NEW FOREST SERIES

Introduction by J. Cowley, and Part 1, Odonata, by Lt.-Col. F. C. Fraser, 1950. 12 pp., 1s. 6d. Part 2, Neuroptera, by Lt.-Col. F. C. Fraser, 1951. 12 pp., 1s. 6d.

EPHEMEROPTERA

Descriptions of some Nymphs of the British Species of the Genus *Baëtis*. By T. T. Macan, 1950. 24 pp., 6 figs., 2 tables, 3s. 0d.

A Description of the Nymph of *Baëtis buceratus* with notes and a key to other species in the genus. By T. T. Macan, 1957. 8 pp., 3s. 6d.

The Life Histories and Migrations of the Ephemeroptera in a stony stream. By T. T. Macan, 1957. 28 pp., 12s. 6d.

ORTHOPTERA, Etc.

A Summary of the Recorded Distribution of British Orthopteroids. By D. K. McE. Kevan, 1952. 16 pp., 5s. 0d.

HEMIPTERA-HETEROPTERA

Contributions towards an Ecological Survey of the Aquatic and Semi-Aquatic Hemiptera-heteroptera of the British Isles.

Scottish Highlands and East and South England. By E. S. Brown, 1948. 45 pp., 7s. 6d.

The Ribble Valley (Lancashire South and Mid). By E. J. Popham, 1949. 44 pp., 1 map, 8s. 0d.

North-East Wales (Denbighshire and Merionethshire). By E. J. Popham, 1951. 12 pp., 2s. 6d.

The Hemiptera-Heteroptera of Kent. By A. M. Massee, 1954. 36 pp., 7s. 6d.

The Bionomics and Immature Stages of the Thistle Lace Bugs (*Tingis ampliata* H.S. and *T. cardui* L.; Hem., Tingidae). By T. R. E. Southwood and G. G. E. Scudder. 8s. 0d.

COLEOPTERA

The Aquatic Coleoptera of North Wales. By E. S. Brown, 1948. 15 pp., 1 fig., 1s. 0d.

The Aquatic Coleoptera of Wood Walton Fen, with some comparisons with Wicken Fen and some other East Anglian Fens. By F. Balfour-Browne, 1951. 36 pp., 4s. 6d.

TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

VOL. 15 JUNE 1962 PART II

Some Corixidae (Hemiptera-Heteroptera) from Bog and Moorland Waters

By D. T. Crisp

(Zoology Department, Durham Colleges in the University of Durham*)

Scattered records exist of the occurrence of Corixidae in some upland areas of Britain, but there has been no comprehensive attempt to examine their distribution over a wide altitudinal range in the Pennines. The present study, made during 1956-58, is an attempt to fill that gap and form a basis for assessing the factors which influence the distribution of some species. The grid references of the habitats are used to denote the bodies of water studied.

Types of Water Bodies

The Pennine water bodies which were investigated are classified as reservoirs, tarns and peat pools and general descriptions of these are given below.

(1) *Reservoirs and Tarns*

The South Pennine reservoirs studied are all associated with water supply and the North Pennine ones with past or present mining activities. All of them have been constructed by building a wall across a valley or on a hillside so as to retain the drainage water from the surrounding moorland. Thus, in each of them, part or all of the margin consists of a sandstone wall sloping steeply down into 0·5 to 4·0 m. (1·5 to 12 ft.) depth of water, below which there is a fairly level bottom of sand or clay which may be overlaid by up to 3 cm. (0·75 in.) of finely divided peat. In general, the reservoirs contain no macroflora apart from restricted patches of *Glyceria fluitans* (L.), *Juncus bulbosus* agg., or *Potomogeton natans* (L.). Exceptions are SK/276762 which has a marginal fringe of *Glyceria fluitans* (L.), NY/787432 which has deep water and a bare, sandy bottom on one side and shallower water with mud and *P. natans* at the other side, and NY/780330 which contains a dense bed of *Carex, Equisetum* and *P. natans* with a narrow strip of deep, open water along one side. The South Pennine reservoirs are from 3·6 to 24 ha. (9 to 60 acres) in area and the North Pennine reservoirs are 0·06 to 3·9 ha. (0·15 to 10 acres).

*Present address: The Nature Conservancy, Merlewood Research Station, Grange-over-Sands, Lancashire.

Three tarns were studied. Tarn NY/736304 occupies 1·0 ha. (2·5 acres) and is about 0·5 m. (1·5 ft.) deep, whilst NY/729283 has an area of 10 ha. (25 acres) and a depth of 1 m. (3 ft.). Both have fairly steeply sloping margins, relatively uniform depth and sandy bottoms, with a covering of finely divided peat and scattered stones. They are practically devoid of rooted vegetation and are in exposed situations and, on occasions, subject to severe wave action. The third tarn studied (NY/667077) is unusual in some respects. It is a calcareous tarn with gently sloping margins, a fairly thick accumulation of mud in many places and beds of *Phragmites communis* Trin. at a number of points around its edge.

(2) *Peat Pools*

Pools varying from ·0005 to ·12 ha. (·00125 to ·25 acres) in area, with maximum depths of 0·3 to 2·0 m. (1 to 6 ft.) but usually less than 1 m. (3 ft.) deep. These pools usually have peat bottoms, but in some, clay or finely divided mine debris form part of the substratum. Stones were rarely found in the peat pools. These pools are often situated in very exposed places but, because of their small size, they rarely suffer severe wave action. The amount of rooted vegetation varies a great deal from pool to pool and may comprise some or all of the following:—*Sphagnum* spp., *Equisetum limosum* L., *Eriophorum angustifolium* Honk., *Carex* spp., *Glyceria fluitans* (L.), *Potomogeton poligonifolius* Pourr., *P. natans* L. and mats of filamentous green alga. Pools of this type are the most common water bodies of the Pennine region.

Methods

As far as possible, collections were made during autumn or spring, when corixid populations were relatively stable. They were obtained by netting all round the margin of each of the smaller water bodies and at as many places as possible round the margin of each of the larger water bodies. Netting was always carried out in water 1 m. (3 ft.) or more in depth as well as in the shallows. There was considerable variation in the amount of time available for collecting at each place, hence the total numbers collected do not bear any relationship to the abundance of Corixidae in the water bodies. When a water body was visited on more than one occasion, a single representative sample analysis is shown in the tables of sample analyses.

Distribution of the Corixidae

Fifteen species of Corixidae were found in the survey and the results are shown in Tables 1 and 2. Their most striking feature is the fact that *Corixa germari* (Fieber), *C. carinata* (C. Sahlberg) and *Glaenocorisa propinqua* (Fieber) were present in most of the larger water bodies. Little has been published about these three species for they have seldom been collected by other workers. It is therefore worthwhile discussing their distribution in the light

of the present results and others presented by Crisp and Heal (1958).

TABLE 1.

SPECIES ANALYSIS OF SAMPLES FROM PENNINE PEAT POOLS

Date 1955-58	Nat. Grid Ref.	Altitude (ft.)	*C. wollastoni* (D. & S.)	*C. nigrolineata* (Fieb.)	*C. sahlbergi* (Fieb.)	*C. lateralis* (Leach)	*C. praeusta* (Fieb.)	*C. punctata* (Illig.)	*C. venusta* (D. & S.)	Totals
22. 4.55	SK/285835	1200	1	24		1				26
22. 4.55	SK/273832	1360	2	6			1			,
22. 4.55	SK/275833	1325	2	3	5					10
22. 4.55	SK/284836	1200	14	3						17
22. 4.55	SK/273835	1355		2						2
12.11.57	SK/267775	1100	10	1	2			1		14
21. 5.57	NY/992307	1600	20	22					2	44
23. 5.57	NY/750358	1900	10	4						14
22.10.56	NY/757325	1800	8	2						10
22.10.56	NY/757327	1800	57	6	1					64
8.10.56	NY/758328	1800	12	1						13
8.10.56	NY/757325	1800	40	1				4		45
8.10.56	NY/765327	1800	43							43
2.10.56	NY/757326	1800	8							8
1.11.56	NY/753355	1750	6		8					14
23. 5.57	NY/753347	1750	1						1	2
23. 5.57	NY/751365	1950	5							5

Water bodies with grid references prefixed "SK" are in the southern Pennines (North Derbyshire or South-west Yorkshire), those prefixed "NY" are in the northern Pennines (Westmorland, Cumberland, Northumberland or Durham).

Corixa germari, *C. carinata* and *Glaenocorisa propinqua* were confined to the tarn and reservoir samples and were found in deeper water than most other British Corixidae. This is shown for *C. germari* by the results of Walton (1943) and Crisp (in Press b.) and for *C. carinata* by the data in Table 3. All the Pennine water bodies where these three species have been found are subject to severe wave action, and Crisp (in Press b.) suggests that the ability of *C. germari* to live in deep water is probably important in enabling the species to avoid the more serious effects of wave action. Walton (1943) records one place where *C. germari* occurred abundantly in rough water where the wind was producing waves half a metre high. Crisp (in Press a.) indicates that *C. germari* can be found on shores subject to severe wave action and can actually be collected there even when waves occur, although in smaller numbers than on still days. This is probably because the animals tend to move into deeper water during rough conditions.

TABLE 2.

SPECIES ANALYSIS OF SAMPLES FROM RESERVOIRS AND TARNS

Date	Nat. Grid Ref.	Altitude (ft.)	*C. wollastoni* (D. & S.)	*C. nigrolineata* (Fieb.)	*C. germari* (Fieb.)	*G. propinqua* (Fieb.)	*C. carinata* (C. Sahlb.)	Other Species	Totals
16. 7.54	SK/259855	1100	6		43	1			50
16. 7.54	SK/263855	1080	4		13	101			118
28. 2.58	SK/278771	1070			277	2			279
3. 9.57	SK/286747	950			5	1			6
7. 6.58	SK/276762	950	1		14			1 p	16
2. 6.59	NY/787432	1600	13		25	6			44
21. 5.57	NY/985310	1500	3			8	29		40
11.11.58	NY/817431	1650	11	4			14		29
2. 6.59	NY/785415	1900	4			2	3		9
30. 4.59	NY/898434	1400	6			3	2	1 s	12
29. 4.59	NY/825430	1600	17			1	4		22
30. 4.59	NY/877446	1550	33			6	9	1 pr, 13 v	62
24. 9.58	NY/998328	1300	17			4		2 v, 1 d	24
—. 9.58	NY/780330	2000	46				2	4 s	52
28.10.58	NY/736304	2500	30			2	87		119
6. 6.57	NY/729283	1200	1		3		1	1 l, 1 v	7
24.11.58	NY/989348	1100	5				2	1 v, 5 sc, 13 d	26
30. 4.59	NY/828468	1350		1	1			1 l, 61 v, 8 d	72
20. 4.57	NY/677077	800						36 do, 3 pr, 24 d, 4 se, 1 f	68

See legend of table 1 for details of localities.

s = *C. sahlbergi* (Fieb.), l = *C. lateralis* (Leach), pr = *C. praeusta* (Fieb.), p = *C. punctata* (Illig.), v = *C. venusta* (D. & S.), sc = *C. scotti* (D. & S.), se = *C. semistriata* (Fieb.), f = *C. fossarum* (Leach), do = *C. dorsalis* Leach, d = *C. distincta* (Fieb.).

TABLE 3.

THE DEPTH DISTRIBUTION OF *C. carinata* AND *C. wollastoni* ON A STONY SHORE IN RESERVOIR NY/985310 ON 21st NOVEMBER 1958.

Habitat	Water depth	*C. carinata*	*C. wollastoni*	Totals
Stony bank	1·0 m	21	1	22
Stony bank	0·5 m	18	12	30
Totals		39	13	52

Chi-squared = 5·2, $P < 0.05$. Hence the difference in relative abundance of the two species at different depths is probably a real one.

Macan (1957) distinguishes between water bodies whose bottoms slope gently from edge to middle and those with steeply

sloping margins and fairly level bottoms. This distinction appears to be particularly important in describing the habitats of *C. germari, C. carinata* and *G. propinqua,* for all the habitats where these three species have been found by the present author were of Macan's second type. The data presented by Crisp and Heal (1958) show that *C. germari* and *G. propinqua* may be found in fairly large water bodies with steeply sloping margins, though absent from nearby large water bodies with gently sloping margins.

TABLE 4.

DISTRIBUTION OF *C. germari* AND *G. propinqua* BETWEEN ROCK AND PEAT SURFACES IN IRISH LAKES, APRIL 1959. (A) *G. propinqua*, (B) *C. germari*.

(A)

	G. propinqua	Other spp. (except *C. germari*)	Totals
Peat	13	107	120
Rock	67	66	133
Totals	80	173	253

Chi-squared = 45·6, $P < 001$.

(B)

	C. germari	Other spp. (except *G. propinqua*)	Totals
Peat	0	107	107
Rock	11	66	77
Totals	11	173	184

Chi-squared = 16·3, $P < 001$.

The walls of the Pennine reservoirs are made of stones and the bottoms of both tarns and reservoirs are littered with stones. The importance of stones as oviposition sites for *C. germari* was noted by Crisp (in Press b.) and casual observations suggest that the other two species also prefer to oviposit on stones. Table 4 shows the distribution of *C. germari* and *G. propinqua* and the total numbers of all other species between rock and peat surfaces in several Irish loughs during April 1959. The results indicate that, relative to the other species, both the deep water species showed a preference for rock surfaces. This almost certainly reflects the oviposition habits of *C. germari* and it is possible that the distribution of *G. propinqua* during the oviposition period results from a preference for stone surfaces as oviposition sites. The absence of these three species from small peat pools may therefore be explained by the scarcity of rocks and stones in such places.

Table 2 shows that *C. germari* and *C. carinata* were rarely taken together, the former being found in places with predominantly sandy bottoms and the latter in places where the bottom was overlaid by finely divided peat. Walton (1943) stated that *C. germari* prefers hard (and therefore, presumably, inorganic) bottoms, but its occurrence in peat bottomed lakes in Eire was

demonstrated by Crisp and Heal (1958). There are two possible reasons for the occurrence of this species in Irish waters which appear more suitable for the closely related *C. carinata.* Firstly, *C. carinata* has not yet been recorded from Ireland and may be absent from the Irish fauna. Secondly, the Irish lakes were at low altitudes and *C. carinata* appears to be restricted to upland waters in the British Isles. It is therefore possible that in Ireland *C. germari* occurs in some habitats, which elsewhere in the British Isles would be occupied by *C. carinata.* The Pennine results suggest that *C. germari* prefers rather larger and deeper bodies of water than *C. carinata,* for the former was found in water bodies of 1·2 to 24 ha. (3 to 60 acres) with banks sloping steeply down into 1·0 to 4·0 m. (3 to 12 ft.) depth of water, whilst, with one exception, the water bodies occupied by *C. carinata* were 0·06 to 4·0 ha. (·15 to 10 acres) in area and only 0·3 to 1·5 m. (1 to 5 ft.) deep at the edges.

G. propinqua was found in water bodies with both peaty and inorganic substrata and, therefore, apart from a need for some stone surfaces, it does not seem to be as selective in its choice of bottom material as are the other two species.

Brown (1945), Macan (1938, 1945) and Popham (1949) state that *C. germari* and *C. carinata* prefer places with little vegetation. Nevertheless, when present in abundance these two species occupy vegetation stands as well as open water—Table 5 and Crisp (in Press b.). In contrast, Walton (1943) rarely found *G. propinqua* anywhere but in open water, and the present author's observations agree with this conclusion.

Corixa wollastoni (D. & S.) was found in water bodies of all types. In the larger water bodies its greatest abundance was attained in shallow water and amongst vegetation, as shown by Tables 3 and 5.

TABLE 5.

THE DISTRIBUTION OF *C. carinata* AND *C. wollastoni* IN RESERVOIR NY/736304 ON 28th OCTOBER 1958.

Habitat	Water depth	*C. carinata*	*C. wollastoni*	Totals
Open water	0·5 m	64	3	67
Carex fringe	0·5 m	23	27	50
Totals		87	30	117

Chi-squared = 30·7, $P < ·001$.

Corixa nigrolineata (Fieb.) was found with *C. wollastoni* in those peat pools which had some inorganic matter in their substrata, but was scarce in pools with bottoms entirely of peat and was not found in the tarn or reservoir samples.

Anomalous Water Bodies

An attempt has been made above to define the types of habitats occupied by *C. germari, C. carinata* and *G. propinqua.* There

were, however, three water bodies listed in Table 2 in which these species were rare or absent. Two of them fulfilled most of the conditions which seem to be required by these species, but tarn NY/667077 did not possess the necessary characteristics (for description see p. 22).

Reservoir NY/828468 was associated with a mine, which was still in operation. It was situated lower down the valley than the mine and spoil heaps and it is possible that the spoil heaps act as a source of enrichment of toxic materials for the reservoir. The reservoir contains trout.

Reservoir NY/989348 is situated on the downhill side of a narrow band of limestone. The water has a pH of 4·6 whilst that of the nearby NY/985310, which receives only base-poor water, has a pH of 3·9. Thus, though the water in NY/989348 may be less acidic than in some of the other reservoirs it is still highly acidic.

The results from these two reservoirs are difficult to explain. Higher base status may be important, but Walton's (1943), Macan's and Lund's (1954) and Macan's (1954) records of *C. germari* from base-rich waters show that this alone does not give an adequate explanation for the absence of this particular species.

Discussion

The present account shows that the habitats of *C. germari, C. carinata* and *G. propinqua* can be typified to some extent. Reservoirs of the type described are fairly common around the 1,000 ft. (300 m.) contour of the Pennines and it is likely that further collecting in these water bodies will show that these three species are quite widespread in the Pennines. It is further suggested that the reason for the scarcity of previous records of these three species simply reflects the fact that little attention has been paid to the corixid faunas of upland reservoirs and little collecting has been done on the stony banks and deep water where these species are most often found.

Summary

1. Species analyses were made of samples of Corixidae from 17 peat pools, 16 reservoirs and 3 tarns, all situated above 800 ft. (290 m.) altitude in the Pennine region. Fifteen species were found, of which five occurred in fairly large numbers.

2. *C. germari, C. carinata* and *G. propinqua* were confined to the tarns and reservoirs. The data show that these three species prefer relatively large, deep water bodies with steeply sloping margins and open water. These water bodies are often subject to severe wave action.

3. *C. germari* was found only in reservoirs with predominantly inorganic bottoms and was replaced by *C. carinata* in water bodies where finely divided peat had accumulated. *G. propinqua* was found in water bodies of both these types.

4. *C. wollastoni* and *C. nigrolineata* predominate in the peat pools, the latter being found in those peat pools with some inorganic matter in their substrata. *C. wollastoni* was also found in the reservoirs and tarns, but *C. nigrolineata* was scarce in these larger water bodies.

Acknowledgments

The author wishes to thank Prof. J. B. Cragg and Dr. T. T. Macan for valuable advice and criticism. All identifications were checked by Dr. T. T. Macan.

The author is indebted to the North East Derbyshire Joint Water Committee, the Sheffield Corporation Waterworks, The Nature Conservancy and other land owners who have permitted samples to be taken from water bodies on their land.

Most of the work was done in the Zoology Department, Durham Colleges, whilst the author held a D.S.I.R. Research Studentship.

References

Brown, E. S. 1945. The Corixidae of the Faeroe Islands, with observations on the geographical distribution of Corixidae in neighbouring parts of the world. *Proc. zool. Soc. Lond.*, **114**: 490-506.

Crisp, D. T., and Heal, O. W. 1958. The Corixidae (O. Hemiptera), Gyrinidae (O. Coleoptera) and Cladocera (S. Ph. Crustacea) of a bog in western Ireland. *Irish Nat. J.*, **12**: 297-304 and 318-324.

Crisp, D. T. (in Press a). Estimates of the annual production of *Corixa germari* (Fieb.) in an upland reservoir. *Arch. Hydrobiol.*

Crisp, D. T. (in Press b). Observations on the biology of *Corixa germari* (Fieb.) (Hemiptera, Heteroptera) in an upland reservoir. *Arch. Hydrobiol.*

Macan, T. T. 1938. Evolution of aquatic habitats with special reference to the distribution of Corixidae. *J. Anim. Ecol.*, **7**: 1-19.

Macan, T. T. 1954. A contribution to the study of the Corixidae (Hemiptera). *J. Anim. Ecol.*, **23**: 115-141.

Macan, T. T., and Lund, J. W. G. 1954. Records from some Irish lakes. *Proc. R. Irish Acad.*, **56** B: 135-157.

Macan, T. T. 1957. Some records of water-bugs in Scotland. *Ent. Gaz.*, **8**: 236-241.

Popham, E. J. 1949. A contribution towards an ecological survey of the aquatic and semi-aquatic Hemiptera-Heteroptera (water-bugs) of the British Isles. The Ribble Valley (Lancashire South and Mid). *Trans. Soc Brit. Ent.*, **10**: 1-44.

Walton, G. A. 1943. The water-bugs (Rhynchota-Hemiptera) of North Somerset. *Trans. Soc. Brit. Ent.*, **8**: 231-290.

LEPIDOPTERA

List of the Lepidoptera of Dorset. Part 2. By W. Parkinson Curtis, 1947. 138 pp., 4 pls., 11s. 0d.

Postural Habits and Colour-Pattern Evolution in Lepidoptera. By M. W. R. de V. Graham, 1950. 16 pp., 4 pls., 4 figs., 4s. 0d.

The Life History and Behaviour of *Coleophora alticolella* Zell. By A. M. Jordan, 1958. 16 pp., 10s. 0d.

HYMENOPTERA

The Hymenoptera Aculeata of Bedfordshire. By V. H. Chambers, 1949. 56 pp., 3 maps, 10s. 0d.

An Introduction to the Natural History of British Sawflies. By R. B. Benson, 1950. 98 pp., 9 pls., 10s. 0d.

Notes on Some British Myrmaridae. By W. D. Hincks, 1950. 42 pp., 5 figs., 1 pl., 5s. 0d.

The British Species of the Genus *Ooctonus* Haliday, with a Note on some Recent Work on the Fairy Flies (Hym., Myrmaridae). By W. D. Hincks, 1952. 12 pp., 8 figs., 4s. 0d.

The Natural History of some *Pamphilius* Species (Hym., Pamphiliidae). By V. H. Chambers, 1952. 16 pp., 4 pls., 5s. 0d.

A Study of some British Species of *Synergus*. By J. Ross, 1951. 16 pp., 4s. 0d.

A Revision of Section I (Mayr, 1872) of the Genus *Synergus* (Hym., Cynipidae) in Britain, with a Species New to Science. By R. D. Eady, 1952. 12 pp., 4 pls., 4s. 0d.

The British Ants Allied to *Formica fusca* L. (Hym., Formicidae). By I. H. H. Yarrow, 1954. 16 pp., 8 figs., 3 maps, 5s. 0d.

The British Ants Allied to *Formica rufa* L. (Hym., Formicidae). By I. H. H. Yarrow, 1955. 48 pp., 58 figs., 1 map, 10s. 6d.

Keys to the British Genera and Species of Elachertinae, Eulophinae, Entedontinae and Eudecrinae (Chalcoidea). By M. W. R. de V. Graham, 1959, 36 pp., 12s. 6d.

A Contribution to the Biology and Taxonomy of the British Species of the Genus *Eudecatoma* Ashmead (Eurytomidae). By M. F. Claridge, 1959. 20 pp., 7s. 0d.

The British Species of the Genus *Alaptus* Haliday in Walker (Chalcidoidea Mymaridae). By W. D. Hincks, 1959. 12 pp., 7s. 6d.

Notes on Pteromalidae (Chalcidoidea) with descriptions of New Genera and Species. By M. W. R. de V. Graham, 1959. 16 pp., 7s. 6d.

DIPTERA

An Outline of a Revised Classification of the Syrphidae (Diptera) on Phylogenetic Lines. By E. R. Goffe, 1952. 28 pp., 3 figs., 6s. 0d.

A Revision of the British (and notes on other) Species of Lonchaeidae (Diptera). By J. E. Collin, 1953. 28 pp., 3 pls., 3 figs., 6s. 0d.

The Distribution and Habits of the British Conopidae (Dipt.). By Kenneth G. V. Smith, 1959. 20 pp., 10s. 6d.

Notes on the Identification of *Limnophila* Larvae (Tipulidae). By Allan Brindle, 1958. 12 pp., 5s. 0d.

A Short Synopsis of the British Scatophagidae. By J. E. Collin, 1958. 20 pp., 7s. 6d.

A Review of the British Subfamilies and Genera of the Family Muscidae. By E. C. M. D'A. Fonseca, 1956. 16 pp., 6s. 0d.

ORDERS, accompanied by the appropriate remittance, should be addressed to Mr. A. BRINDLE, Manchester Museum, Manchester, 13.

BRITISH TRUST FOR ENTOMOLOGY LTD.
41 QUEEN'S GATE, LONDON, S.W.7

"THE ENTOMOLOGIST"

AND

"TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY"

Editors:

E. J. POPHAM, D.Sc., Ph.D., A.R.C.S., F.R.E.S.
Department of Zoology, The University, Manchester 13

N. D. RILEY, C.B.E., F.Z.S., F.R.E.S.
7 McKay Road, Wimbledon, London, S.W.20

Assistant Editor:

R. R. ASKEW, B.Sc., D.Phil., F.R.E.S.
Department of Zoology, The University, Manchester 13

Other Members of the Editorial Board:

A. Brindle, F.R.E.S.
A. E. Gardner, F.R.E.S.
J. W. Heslop Harrison, D.Sc., F.R.S., F.R.S.E.
Francis Hemming, C.M.G., C.B.E., F.R.E.S.
H. E. Hinton, B.Sc., Ph.D., Sc.D., F.R.S., F.R.E.S.
B. M. Hobby, M.A., D.Phil., F.L.S., F.R.E.S.
H. C. Huggins, F.R.E.S.
G. J. Kerrich, M.A., F.L.S., F.R.E.S.
H. B. D. Kettlewell, M.A., M.B., B.Chir., F.R.E.S.
O. W. Richards, M.A., D.Sc., F.R.S., F.R.E.S.
T. R. E. Southwood, B.Sc., Ph.D., F.R.E.S.

All enquiries concerning membership and subscriptions and orders for back numbers of *The Entomologist* as well as of the *Journal* and *Transactions of the Society for British Entomology* should be sent to:—

Dr. H. HENSON,
Dept. of Zoology, The University, Leeds.

SUBSCRIPTIONS

The subscription rate is 35/- per annum, payable in January each year. Cheques, money orders, etc., should be made payable to *The Entomologist* and sent to Dr. H. Henson, Dept. of Zoology, University, Leeds.

ADVERTISING

Apply Dr. E. J. Popham, Department of Zoology, The University, Manchester.

T. BUNCLE AND CO. LTD., ARBROATH.